

# Studies on Victorian bryophytes 11. The genus *Acromastigum* A.Evans

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## Abstract

Three species of the liverwort genus *Acromastigum* have been reported from Victoria. They are *A. colensoanum* (Mitt.) A.Evans ex Reimers, *A. exiguum* (Steph.) A.Evans and *A. mooreanum* (Steph.) E.A.Hodgs. Only *Acromastigum colensoanum* and *A. exiguum* are accepted as Victorian species. These species are described and illustrated. (*The Victorian Naturalist* 126 (5), 2009, 163–169)

**Keywords:** bryophyte, flora, Lepidoziaceae, liverwort, Victoria

## Introduction

The liverwort genus *Acromastigum* (family Lepidoziaceae) was erected by Alexander Evans as a segregate from *Bazzania* to accommodate *A. integrifolium* (Aust.) A.Evans from Hawaii (Evans 1900). Evans initially differentiated the new genus from *Bazzania* on two major characters:

- Each ventral branch replaces part of an underleaf and arises from the cortex, whereas in *Bazzania* each ventral branch arises from the axil of an underleaf and is intercalary in origin.
- Terminal branches alternately replace one half and then the other half of a whole leaf, so that ventral half-leaves alternate with dorsal

half-leaves in the axils of the branch, a pattern consequently called '*Acromastigum* type'. In *Bazzania* terminal branches always replace the postical half of a leaf, leaving a half-leaf on the dorsal side of the stem.

Since then numerous species have been transferred from *Bazzania* and *Mastigobryum* to *Acromastigum*, and many new species have been described. Evans also refined his concept of the genus in a world-wide revision, although this did not affect the Australian species (Evans 1933). Seven species have been recognised in the Australian flora (McCarthy 2006), as follows:

- A. anisostomum* (Lehm. & Lindenb.) A.Evans — Tasmania, New South Wales
- A. cavifolium* R.M.Schust. — Tasmania
- A. colensoanum* (Mitt.) A.Evans ex Reimers — Tasmania, Victoria, New South Wales, Australian Capital Territory, Queensland
- A. echinatiforme* (De Not.) A.Evans — Queensland
- A. exiguum* (Steph.) A.Evans — Victoria, New South Wales
- A. mooreanum* (Steph.) E.A.Hodgs. — New South Wales, Australian Capital Territory, Tasmania, Victoria
- A. verticale* (Steph.) E.A.Hodgs. — Tasmania

These seven species may be distinguished using the following key.

## Key to the Australian species of *Acromastigum*

- 1 Leaf insertion transverse to weakly incubous; Tasmania only ..... 2  
 Leaf insertion very clearly incubous; Tasmania to tropical Queensland ..... 3
- 2 Leaves strongly concave ..... *cavifolium*  
 Leaves weakly to not at all concave ..... *verticale*
- 3 Leaf apex entire to very shortly bifid; growing on calcareous rock or soil ..... *exiguum*  
 Leaf apex always distinctly bilobed; growing on various substrates ..... 4
- 4 Postical lobe equal to the antical lobe in length; leaves without a vitta ..... *colensoanum*  
 Postical lobe clearly longer than antical lobe; vitta present or not ..... 5

- 5 Postal lobe linear-ligulate, 2 cells wide, mostly 4 or more times the length of the dorsal lobe; vitta present ..... *mooreanum*  
 Postal lobe  $\pm$  narrowly triangular from a broad base, mostly not more than twice the length of the dorsal lobe; vitta present or not ..... 6
- 6 Distinct vitta of larger cells present in postal part of leaf; postal lobe triangular, with a  $\pm$  straight postal margin; plant of temperate regions, yellowish green to olive brown in life ..... *anisostomum*
- Vitta lacking; postal lobe claw-shaped, with a distinctly curved postal margin; plant of tropical regions, pale to dark brown in life ..... *echinatiforme*

During a revision of the genus *Bazzania* for Australia, all specimens of *Acromastigium* from Victoria held in the National Herbarium of Victoria (MEL), University of Melbourne Herbarium (MELU) and Canberra Botanic Gardens Herbarium (CANB) were examined, because of their possible confusion with *Bazzania* species. All turned out to be *A. colensoanum*. No specimens of *A. exiguum* or *A. mooreanum* from Victoria could be found.

*Acromastigium exiguum* was described by Stephani (1886), who did not mention a collector and stated the locality only as 'Australia meridionalis', which means southern Australia. He also noted that the type was in his own herbarium. Later he noted a collection by Wilhelm Bäuerlen from 'Australia felix' (Stephani 1889), and in his *Species Hepaticarum* stated 'Hab. Australia. Victoria (Bäuerlen)' (Stephani 1908). Evans (1933) took this to refer to the type material, and so stated the type locality as Victoria. Bäuerlen collected many cryptogams for Ferdinand von Mueller in the early 1880s, including material from East Gippsland in 1885 (Delegate River region) and 1887 (Croajingolong) (D. Cameron, DSE, pers. comm. August 2008). Since *Acromastigium exiguum* was published in 1886, the type must have been collected from the Delegate River region, and it is therefore the only collection known from Victoria. *Acromastigium exiguum* was described by Scott (1985) as having entire leaves, probably on account of Stephani's short description in *Species Hepaticarum* (Stephani 1908) and sketch in the *Icones* (Stephani 1985). But Evans (1933), who saw the type, noted in particular that the leaves are mostly bidenticulate, bidentate or bifid.

All *Acromastigium* specimens from New South Wales examined in this study that were labelled *A. anisostomum* turned out to be *A. exiguum*, so that in Australia *A. anisostomum* should be considered to be restricted to Tasmania. Its

range reportedly extends to New Zealand and Patagonian Chile (Evans 1933).

The type of *Acromastigium mooreanum* was collected in Tasmania by TB Moore (Stephani 1908). The only report of *A. mooreanum* from Victoria was by Scott (1985), but he gave no further information. Because no specimens from Victoria have been found in this study and no other literature records seem to exist, it is discounted here from the Victorian flora.

William Mitten first described *Acromastigium colensoanum* (as *Mastigobryum colensoanum*) from a specimen collected by William Colenso in the Tararua Range on the North Island of New Zealand: 'a small species, readily distinguished from all its congeners by its nearly equally bidentate leaves, which have the lesser tooth on the ventral side, and not, as occurs in *M. anisostomum* and the other bidentate-leaved species, on the dorsal, nor are the leaves papillose' (Mitten 1855).

Carl Gottsche described *Mastigobryum divaricatum* var. *muellerianum* from a specimen collected (presumably in Australia) by Ferdinand von Mueller: 'dentibus inaequilibus (ventrali majore) subconniventibus ... Frustulum tantum inter alias Hepaticas repens inveni' (Gottsche 1857). This is clearly not *Acromastigium colensoanum*, because in Gottsche's description and illustration the postal lobe is the larger of the two. However, its true identity will not be known until the type is located. The most likely candidate is *Acromastigium echinatiforme*, which is known from Queensland, where Mueller made extensive collections. *Acromastigium anisostomum* is another possibility, but hardly resembles *A. divaricatum*.

In regard to the other Australian species, the author believes *A. cavifolium* is likely to be the same as *A. verticale*, and perhaps even *A. integrifolium*, which occurs in New Zealand.

From the present study, the following revised list of Australian species and their distributions is suggested:

*A. anisostomum* (Lehm. & Lindenb.) A.Evans — Tasmania

*A. cavifolium* R.M.Schust. — Tasmania

*A. colensoanum* (Mitt.) A.Evans ex Reimers — Tasmania, Victoria, New South Wales, Australian Capital Territory, Queensland

*A. echinatifolium* (De Not.) A.Evans — Queensland

*A. exiguum* (Steph.) A.Evans — Victoria, New South Wales

*A. mooreanum* (Steph.) E.A.Hodgs. — Tasmania

*A. verticale* (Steph.) E.A.Hodgs. — Tasmania

### Descriptions

*Acromastigum colensoanum* (Mitt.) A.Evans ex Reimers, *Hedwigia* 73: 142 (1933)

**Plants** yellowish green to mid-green, forming mats or creeping among other bryophytes. **Shoots** to about 2.1 mm wide; stems about 200  $\mu$ m in diameter, 4–5 cells wide in surface view; in cross-section with a cortex of about 15 inflated cells and a medulla of about 20 smaller cells. **Terminal branching** common, always pseudodichotomous, the branches *Acromastigum* type. **Dorsal and ventral half-leaves** narrowly ovate, apex entire, acute. **Leaves** overlapping to slightly distant,  $\pm$  oblong to ovate-oblong, bifid, mostly 0.7–1.0 mm long and 0.35–0.45 mm wide; antical margin weakly to strongly ampliate, postcal margin straight to slightly incurved; lobes  $\pm$  equal in length, up to about 1/4 to 1/3 of the total leaf length, postcal lobe distinctly narrower than antical lobe; **cells** roundly hexagonal to quadrate, typically 18–25  $\mu$ m wide and long in mid-leaf, becoming longer towards the base and smaller towards the margins and apex, with minute or no trigones. **Underleaves**  $\pm$  cuneate or quadrate to almost circular, to about 0.2 mm wide and long, divided to about half way into 3 lobes, the lobes 2–4(–8) cells wide and often topped by a slime papilla; **cells** similar to those in the leaves but smaller, chlorophyllous throughout; first branch underleaf similar but bifid. **Microphyllous ventral branches** common, branches about 100  $\mu$ m wide, replacing two lobes of an underleaf, the microphylls bifid and with cells similar to those of the underleaves. **Gynoeceium** very common, on a very short ventral branch, perianth 3–4 mm long when mature, pale green, fusiform, strongly pleated, mouth very narrow and very shortly dentate. **Bracts** deeply bifid with a few

small accessory teeth, cells thin-walled, hyaline. **Androeceium** not seen. (Fig. 1)

**Known distribution:** Tas, Vic, NSW, Queensland, New Zealand. (Fig. 3)

**Habitat:** Rotting logs, tree-fern trunks and the bark of trees (rarely on soil) in cool temperate rainforest, mixed forest and wet sclerophyll forest.

*Acromastigum exiguum* (Steph.) A.Evans, *Annales Bryologici* 3 (suppl.): 75 (1934)

**Plants** mid to dark green, forming mats or creeping among other bryophytes. **Shoots** to about 800  $\mu$ m wide but width varying considerably; stems about 120  $\mu$ m in diameter, 2–3 cells wide in surface view; in cross-section with a cortex of about 7 inflated cells and a medulla of about 5–7 smaller cells. **Terminal branching** common, always pseudodichotomous, the branches *Acromastigum* type. **Dorsal and ventral half-leaves** narrowly ovate, apex entire, acute. **Leaves** overlapping, asymmetrically ovate, rather brittle, very shortly bifid to  $\pm$  entire, mostly 0.3–0.4 mm long and 0.15–0.25 mm wide; antical margin weakly to strongly ampliate, postcal margin straight to slightly outcurved, both margins very thick and pellucid, irregularly crenulate; postcal lobe longer and wider than the antical lobe, antical lobe often greatly reduced or absent; **dorsal surface** finely and densely striate-papillose; **cells** roundly hexagonal to quadrate, typically 12–15  $\mu$ m wide and long in mid-leaf, becoming longer towards the base and smaller towards the margins and apex, with minute or no trigones; a pair of cells sometimes overlying the base of the leaf on the dorsal side. **Underleaves**  $\pm$  cuneate to broadly circular, to about 0.20 mm wide and 0.15 mm wide, divided to about half way into 3 lobes, the lobes 2–4(–6) cells wide; **cells** similar to those in the leaves, chlorophyllous throughout; **surface** papillose as in the leaves; first branch underleaf similar but bifid. **Microphyllous ventral branches** infrequent, branches about 80–100  $\mu$ m wide, replacing two lobes of an underleaf, the microphylls bifid and with cells similar to those of the underleaves. **Gynoeceium** not seen. **Androeceium** not seen. (Fig. 2)

**Known distribution:** Vic, NSW. (Fig. 4)

**Habitat:** Calcareous rock and soil in cool temperate rainforest, mixed forest and wet sclerophyll forest.

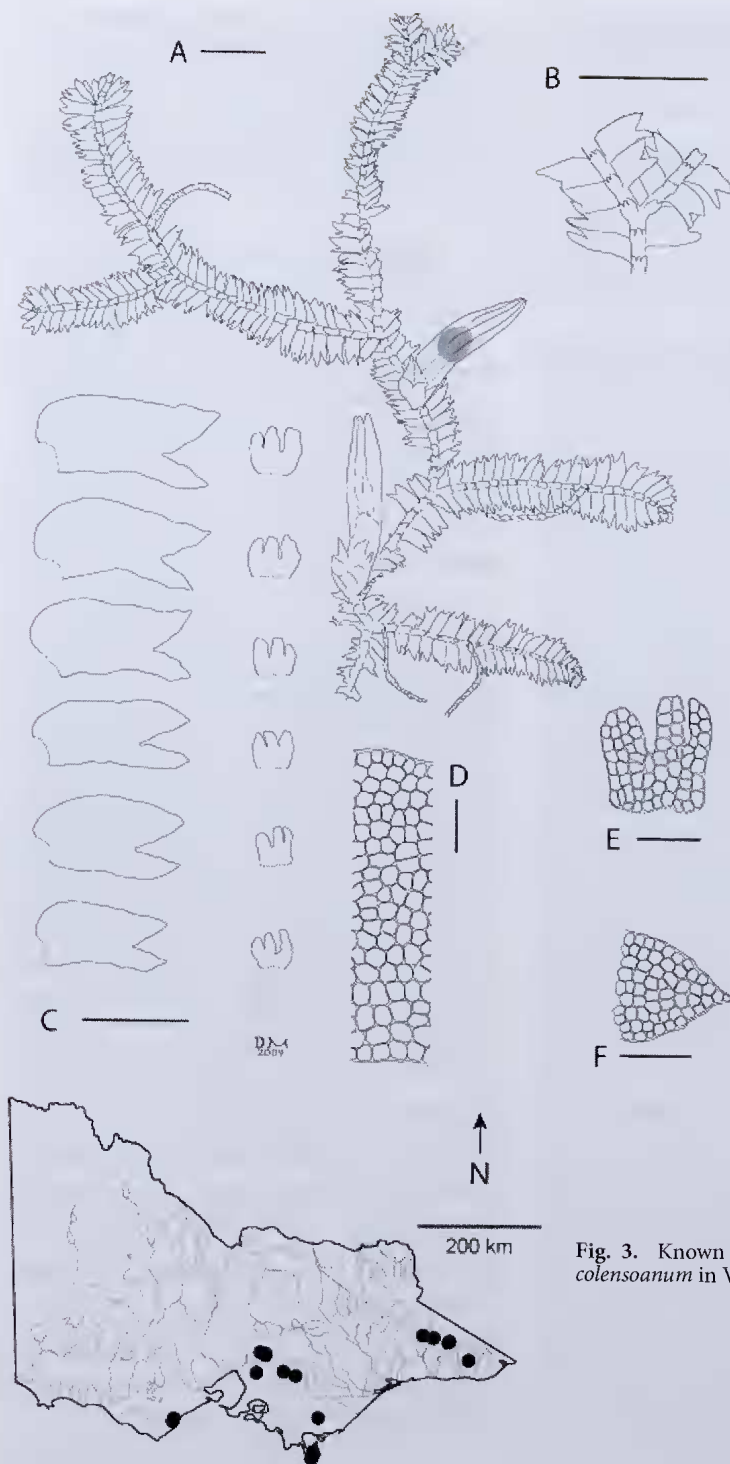


Fig. 1. *Acromastigum colensoanum*. A. - Ventral view of part of fertile female plant, with two perianths (the upper one with a maturing capsule). B. - Ventral view of shoot showing *Acromastigum*-type branching. C. - Leaves (an- tical margin at top) and underleaves. D. Plane section through midleaf. E. - Underleaf. F. - Leaf lobe. Scale bars: A = 1 mm, B,C = 500  $\mu$ m, D,E,F = 100  $\mu$ m.

Fig. 3. Known distribution of *Acromastigum colensoanum* in Victoria.



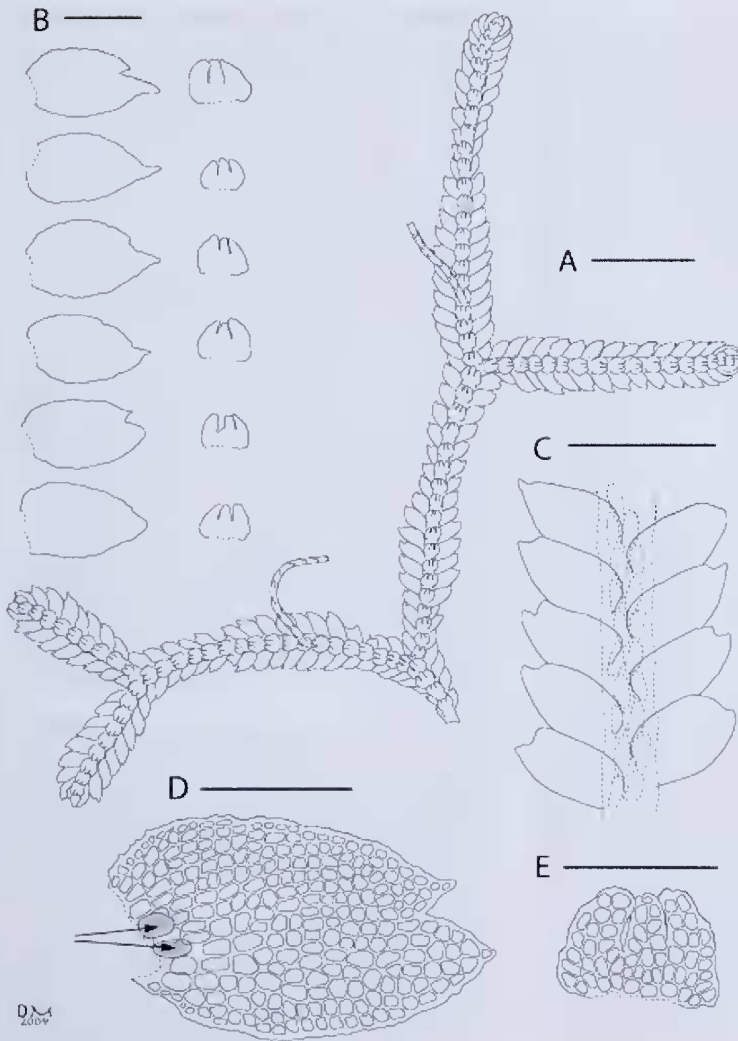


Fig. 2. *Acromastigum exiguum*. A. Ventral view of part of plant. B. Leaves (antical margin at top) and underleaves. C. Dorsal view of part of stem, showing stem outline and clearly visible cortical cells. D. Whole leaf, with overlying dorsal cells arrowed. E. Underleaf. Scale bars: A = 2 mm, B,D,E = 200 µm, C = 500 µm.



Fig. 4. Known distribution of *Acromastigum exiguum* in Victoria.

### Similar taxa

The major differences between *Acromastigum* and *Bazzania* have been mentioned already. In other regions several small bifid or entire-leaved species of *Bazzania* could be confused with *Acromastigum*, but in Victoria only *B. hochstetteri* (Rchdt) E.A.Hodgs. might be confused with *A. colensoanum*. *Bazzania hochstetteri* almost always has some 3-lobed leaves, and its underleaves are entire or weakly crenate, not lobed. All other similar-looking species, such as *Geocalyx caledonicus* Steph., can be distinguished immediately because they lack underleaves or ventral branches, or both.

*Acromastigum divaricatum* (Lindenb.) A.Evans is outwardly very similar in appearance, but as well as its vastly different distribution — China, Indomalesia and Solomon Islands — it is distinguished by its very much smaller size, with more rectangular leaves and a postical leaf lobe that is usually slightly longer and not much narrower than the antical lobe. Furthermore, its colour is whitish green to pale yellowish green and the leaves are strongly caducous, and sporophytes (which are very common in *A. colensoanum*) are unknown (Piippo 1991).

*Acromastigum exiguum* is very similar indeed to *A. marginatum* E.A.Hodgs., a New Zealand endemic, and Schuster (2000) suggested that they might be conspecific. However, the underleaves in *A. marginatum* have very much smaller and more densely packed cells, with leaf lobes 4–7(11) cells wide at the base (Engel and Glennly 2008). That might be enough to maintain the separation of the species, but a thorough examination of the types and a large number of collections from Australia and New Zealand would be needed to determine whether the difference is constant. If the two were found to be conspecific, the epithet *exiguum* would have priority.

### Representative specimens examined

#### *Acromastigum anisostomum*

NEW ZEALAND — SOUTH ISLAND: Red Hill, Barrier Range, Scott s.n., Dec 1969, MELU-1354 (dupl. OTA-26569).

CHILE — Around Lenca, c. 25 km s-e of Pt Montt, Llanquihue, Inoue s.n., 10 Nov 1981, MELU, s.n. (Inoue Bryophyta Selecta Exsiccata 701.)

#### *Acromastigum colensoanum*

VICTORIA — Sassafras Creek, Ellery Camp, Streimann 43723, Feb 1990, CBG-9007708;

Errinundra Plateau, headwaters of West Errinundra River, Chesterfield 3301 & Cook, Mar 1982, MEL-2021123; Warburton, Bastow s.n., Feb 1902, MEL-1037679; Tarra-Bulga NP, Bulga section, Thies FN1627K, Feb 1997, MEL-241226; headwaters of Blackfish Creek, Wilsons Promontory NP, Meagher s.n., Jul 1996, MEL-240158; Toolangi-Black Range SE, Wirrawilla Rainforest Walk, Stajsic & Klazenga VS2311, Jun 2001, MEL-2108572; Mueller s.n., source of the Yarra, undated, MEL-1037623; Black Spur, Bastow s.n., Nov 1900, MEL-1037608; Clematis Gully, Sherbrooke Forest, Bibby s.n., Jul 1948, MEL-1037677; Turtons Track, west of Tanybryn, Otway Range, Thies FN1500A, Feb 1987, MEL-1050717; jungle at Mt Drummer, Willis s.n., MEL-1037682; Paradise Valley, Wilsons Promontory, Meagher s.n., Jan 2003, herb. D.A. Meagher 782 (MELU); Western Tyers River, Baw Baw Ranges, Meagher s.n., Jun 2008, herb. D.A. Meagher 4599 (MELU); Beenak, Scott s.n., May 1975, MUCV-2796 (MELU); Kallista, Powell & Wykes s.n., Nov 1973, MUCV-4208 (MELU); Martins Creek Flora Reserve, Bonang Highway, Scott & Chesterfield s.n., Dec 1988, MELU-911.

TASMANIA — Mount Wellington, Gulliver s.n., undated, MEL-1037680.

NEW SOUTH WALES — Pinkwood Creek, Hanging Mountain Forest Reserve, Curnow 3401, Jun 1990, CBG-9404981; Lamonds Creek, Barren Grounds NR, Coveny 16071, Apr 1992, MEL-2058332.

#### *Acromastigum divaricatum*

INDONESIA — SUMATRA: Mount Nantifo, Meijer 6288, Nov 1955, MEL-301605.

PAPUA NEW GUINEA — SOUTHERN HIGHLANDS: Tambul-Mendi road, SW of Tambul, Streimann 26760, Dec 1982, CBG-8909603.

#### *Acromastigum echinatifforme*

QUEENSLAND — Mt Finnigan Range, Cedar Bay National Park, Streimann 57144, CBG-9519287; Mount Lewis, Scott s.n., Aug 1985, MUCV-7400 (MELU); Bellenden Ker, track to Centre Peak, Scott Sept 1986, MELU-142; Bellenden Ker, Stone s.n., Sep 1987, MELU-608.

#### *Acromastigum exiguum*

NEW SOUTH WALES — Mossman Bay, Whitelegge 54, Dec 1884, MEL-1037670; Mossman Bay, Whitelegge 47, Dec 1884, MEL-1037671; Carrington Falls, Schofield &

Schofield 79286, Jun 1983, MEL-2277549; track to Grand Canyon, Blue Mountains NP, Stajsic 2649 & Klazenga, Sep 2001, MEL-2133860; track to Dantes Glen, Blue Mountains NP, Stajsic 2735 & Klazenga, Sep 2001, MEL-2136332; Pierces Pass, Blue Mountains NP, Stajsic 2794 & Klazenga, Sep 2001, MEL-2137131; track to Grand Canyon, Blue Mountains NP, Stajsic 2648 & Klazenga, Sep 2001, MEL-2133859; Bilpin Gorge walk, Stajsic 2779 & Klazenga, Sep 2001, MEL-2136376; Bilpin Gorge, Waratah Gardens Picnic Area, approx. 5 km ENE of Mt Tomah Botanic Gardens, Curnow 5348, CANB-632018.

### *Acromastigum marginatum*

NEW ZEALAND — SOUTH ISLAND: Cascade Cove, Dusky Sound, Scott s.n., Feb 1969, MELU s.n. (OTA-24042).

### *Acromastigum mooreanum*

TASMANIA — Jones Walk (locality unknown), Moore 65, undated, MEL-1037645; Lune River Road, Curnow 2688, Dec 1988, CBG-8808056; Waldheim, Cradle Mountain, Scott s.n., undated, MELU-2690.

### Glossary

**Acromastigum-type branching** terminal branching in which branches with ventral half-leaves in the branch axils alternate with branches with dorsal half-leaves in the branch axils

**antical** nearest to the apex of the stem or shoot

**dioicous** having male and female organs on different plants

**dorsal** on the side of the stem farthest from the substrate

**incubous** orientated so that the antical leaf margin is on the dorsal side of the stem

**microphyll** a minute leaf or underleaf on a microphyllous branch

**postical** farthest from the apex of the stem or shoot

**shoot** an unbranched segment of a plant

**ventral** on the side of the stem closest to the substrate, or from which underleaves or rhizoids arise

**microphyllous ventral branch** a branch produced on the ventral side of the stem, arising from the cortical (outer) cells and replacing part of an underleaf

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### Note

<sup>1</sup> That is, 'with unequal lobes (ventral larger) subconnivent ... A small piece found creeping between other liverworts'.

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